An exploratory study of e-business and e-commerce implementation in Japan

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Abstract

Internet and other online networks have given rise to the digital economy to support electronic business and electronic commerce. This study conducts an exploratory study of e-business and e-commerce implementation in Japan. Firstly, according to factor analysis, 9 e-business contents are classified into four factors namely, for sale to customers, the management action in the company, procurement activities, and manufacturing activity. Secondly, as a result of cluster analysis, industries are classified into five clusters according to the grade of execution of e-business, and the contents of execution.

Introduction

Online networks including internet have given rise to the digital economy to support electronic business (e-business) activities. But it varies according to a type of industry how many enterprises perform e-business. The purpose of working on e-business is also the same.

This study shows that the implementation status of e-business of each industry. E-business using an online network is various, such as not only sales or purchase trading but also activities inside the company. The latter examples are activities of a direct department called production or physical distribution, and a back-office section called accounts or personnel. And purposes of companies that perform e-business may be various, for example sales expansion, cost reduction, and information sharing.

In Japan, before the Internet known as an open online network spreads, former closed online network such as Value Added Network (VAN) has been popular to companies in 1980's. Therefore, companies could use e-business in internal business process integration or to specific partners. The

examples are Electronic Data Interchange (EDI), Supply Chain Management (SCM), Enterprise Resource Planning (ERP). But in fact, e-commerce is more popular than ERP and SCM. That may be why an effect comes out of e-commerce in the short term, such as reduction of office work cost, improvement in customer satisfaction, and the reduction of an input cost.

Literature Review

Iacovou et al (1995) recommends the development of successful EDI partner expansion plans, which include EDI initiators pursue promotional efforts to improve partners' (especially small partners') perceptions of EDI benefits, provide financial and technological assistance to partners with low organizational readiness, carefully select and enact influence strategies to reduce resistance. Fisher (1997) concludes the effectiveness of SCM varies according to the matrix of product properties and purpose of SCM. From the viewpoint of marketing partnership, Doney et al (1997) shows that supplier size and supplier's willingness to customer have a positive impact on buyers' trust. Chatterjee et al (2002) shows that companies structuring e-commerce platform should have top management championship, strategic investment rationale, and extent of coordination. According to these studies, the effectiveness of e-business changes by the factor of inside and outside the company, for example the relations with a characteristic of type of industry and the trading partner.

MTI (2006) shows the result of a questionnaire to companies of Japan and USA why they work on e-commerce. According to this survey, Japanese companies think as important cost reductions from the standpoint of a request from a customer and efficiency of ordering business. On the other hand, USA companies think as important sales expansions, for example, new customer acquisition and expansion of a sales channel. SMEA(2009), belongs to MTI, shows Small and medium sized enterprises (SMEs) which consider "reduction of trading costs" to be a benefit are greatest in number, but when looked at in terms of employee size, the smaller the enterprise, the larger the number citing that it is "easy to acquire new customers." These suggest engaging e-commerce actively is important as a means of acquiring customers for small companies as well.

MIC (2012) shows the result of an annualy mail survey with about 2,000 enterprises; 87.5% of companies have built a company communication network such as internet, the percentage of businesses using e-commerce (procurement/sales via the Internet) is 44.5%, and the percentage of businesses using at least a part of a cloud computing serviceis 21.6%, which is 7.5 percentage points more than the 14.1% rate at the end of 2010.

Research Methodology

This study conducts a statistical secondary analysis using large-scale survey. The original survey is "Results of the Basic Survey of Business and Activity on March 31, 2009" provided Ministry of Economy, Trade and Industry in Japan. The survey is a mail on self-declaration forms given to companies which engaged in business with both a minimum capital of 30 million yen and 50 or more employees. Questions include size and profit of companies, online network usage and e-business implementation. It covers over 28,000 enterprises which operate mining, manufacturing, and wholesale and retail trade, and eating and drinking places. This study analyzes the semi total data for every 103 types of industry because the reply for each company is not disclosed.

This exploratory study conducts general descriptive statistics, factor analysis, and cluster analysis by SPSS (Ver20.0) in order to clarify the measure situation of the e-business of companies.

Results

Table 1 provides the descriptive statistical summary of 103 industries which have each from 5 to 1,325 companies. 4 items of the start show the scale and profits level for every industry. OperProfit_Sales is operating profit on sales which total operating profit (or loss) divided by total sales of each industry. The mean is about 3% though numerical value may be minus that is the operating loss depending on the industry.

Table1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
@employee	103	128	4161	467.65	521.796
@TotalAssets	103	3,029	1,252,416	40,888.85	129,274.055
@Sales	103	2,585	691,621	38,606.68	89,013.467
OperProfit_Sales	103	-.024	.376	.03123	.045817
LAN	103	.73	.99	.8995	.04276
WAN	103	.21	.81	.4453	.11649
OpenNet	103	.00	.18	.0558	.03225
Internet	103	.23	.79	.5453	.06194
Sales	103	.03	.60	.2884	.10558
Purchase	103	.00	.44	.1390	.06973
Design	103	.00	.15	.0140	.02002
Production	103	.00	.20	.0473	.03823
Inventory	103	.00	.20	.0611	.03528
Distribution	103	.00	.20	.0625	.03935
Cost	103	.00	.08	.0177	.01345
Accounting	103	.00	.21	.0536	.03087
Personnel	103	.00	.18	.0419	.02532

Table2: Correlations

		Sales	Purchase	Design	Production	Inventory	Distribution	Cost	Accounting	Personnel	@Total Assets	OperProfit_ Sales	LAN	Internet
Sales	Pearson	1	.358**	-.047	.241*	.569**	.567**	.296**	.333**	.275**	.012	-.137	.218*	.176
	Sig. (2-tailed)		.000	.636	.014	.000	.000	.002	.001	.005	.901	.169	.027	.076
	N	103	103	103	103	103	103	103	103	103	103	103	103	103
Purchase	Pearson	.358**	1	.492**	.284**	.414**	.244*	.242*	.550**	.398**	.479**	-.176	.255**	.281**
	Sig. (2-tailed)	.000		.000	.004	.000	.013	.014	.000	.000	.000	.075	.009	.004
	N	103	103	103	103	103	103	103	103	103	103	103	103	103
Design	Pearson	-.047	.492**	1	.433**	.176	.036	.239*	.394**	.399**	.611**	-.101	.207*	.339**
	Sig. (2-tailed)	.636	.000		.000	.076	.721	.015	.000	.000	.000	.312	.036	.000
	N	103	103	103	103	103	103	103	103	103	103	103	103	103
Production	Pearson	.241*	.284**	.433**	1	.450**	.342**	.291**	.150	.081	.044	-.130	.041	-.036
	Sig. (2-tailed)	.014	.004	.000		.000	.000	.003	.131	.413	.660	.189	.684	.721
	N	103	103	103	103	103	103	103	103	103	103	103	103	103
Inventory	Pearson	.569**	.414**	.176	.450**	1	.732**	.431**	.412**	.364**	.230*	-.198*	.074	.121
	Sig. (2-tailed)	.000	.000	.076	.000		.000	.000	.000	.000	.019	.045	.455	.224
	N	103	103	103	103	103	103	103	103	103	103	103	103	103
Distribution	Pearson	.567**	.244*	.036	.342**	.732**	1	.417**	.352**	.367**	.165	-.204*	-.039	.174
	Sig. (2-tailed)	.000	.013	.721	.000	.000		.000	.000	.000	.095	.039	.697	.078
	N	103	103	103	103	103	103	103	103	103	103	103	103	103
Cost	Pearson	.296**	.242*	.239*	.291**	.431**	.417**	1	.585**	.586**	.101	.037	.070	.095
	Sig. (2-tailed)	.002	.014	.015	.003	.000	.000		.000	.000	.309	.710	.485	.339
	N	103	103	103	103	103	103	103	103	103	103	103	103	103
Accounting	Pearson	.333**	.550**	.394**	.150	.412**	.352**	.585**	1	.794**	.593**	-.076	.085	.200*
	Sig. (2-tailed)	.001	.000	.000	.131	.000	.000	.000		.000	.000	.443	.392	.043
	N	103	103	103	103	103	103	103	103	103	103	103	103	103
Personnel	Pearson	.275**	.398**	.399**	.081	.364**	.367**	.586**	.794**	1	.540**	.016	.096	.356**
	Sig. (2-tailed)	.005	.000	.000	.413	.000	.000	.000	.000		.000	.873	.335	.000
	N	103	103	103	103	103	103	103	103	103	103	103	103	103
@TotalAssets	Pearson	.012	.479**	.611**	.044	.230*	.165	.101	.593**	.540**	1	-.008	.027	.310**
	Sig. (2-tailed)	.901	.000	.000	.660	.019	.095	.309	.000	.000		.934	.785	.001
	N	103	103	103	103	103	103	103	103	103	103	103	103	103
OperProfit_Sales	Pearson	-.137	-.176	-.101	-.130	-.198*	-.204*	.037	-.076	.016	-.008	1	.271**	-.066
	Sig. (2-tailed)	.169	.075	.312	.189	.045	.039	.710	.443	.873	.934		.006	.505
	N	103	103	103	103	103	103	103	103	103	103	103	103	103
LAN	Pearson	.218*	.255**	.207*	.041	.074	-.039	.070	.085	.096	.027	.271**	1	.131
	Sig. (2-tailed)	.027	.009	.036	.684	.455	.697	.485	.392	.335	.785	.006		.189
	N	103	103	103	103	103	103	103	103	103	103	103	103	103
Internet	Pearson	.176	.281**	.339**	-.036	.121	.174	.095	.200*	.356**	.310**	-.066	.131	1
	Sig. (2-tailed)	.076	.004	.000	.721	.224	.078	.339	.043	.000	.001	.505	.189	
	N	103	103	103	103	103	103	103	103	103	103	103	103	103

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The following 4 items show the use situation of the online network. Almost all companies use the online network for business. Especially, the utilization rate of LAN used inside a company is the highest, and the internet ranks second to it. The last 9 items show details of e-business which companies work on. Both Sales which means the sale to customers and Purchase which means procurement are e-commerce, which are used higher than other 7 e-business activities.

Table 2 provides the correlation of e-business, scale and profits level and network usage. Since the correlation of three indices (employee, total assets sales per company) is high, total assets per company is used in the table. Also because LAN and Internet are popular network, these are used in the table. According to the table, the correlation between each e-business is high in many cases but the correlation between e-business and operating profit on sales is not high. In addition, it does not

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Table3-1: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.744
Bartlett's Test of Sphericity	Approx. Chi-Square	466.300
	df	45
	Sig.	.000

Table3-2: Goodness-of-fit Test

Chi-Square	df	Sig.
17.262	11	.100

mention especially by correlation with usage of e-business and online network.

Therefore, this study conducts factor analysis based on the use situation of the information technology packed for every type of industry. The situation includes computer intra network (i.e. LAN and other networks built within the company) usage and 9 e-business implementations, which are Sales, Purchase, Design control, Production control, Inventory control, Distribution control, Cost control, Accounting control, Personnel and payroll management.

Table3-1 shows two points. First, as Kaiser-Meyer-Olkin Measure of Sampling Adequacy is >0.5, it is not inappropriate to perform the factor analysis. Second, as significance of Bartlett's Test of Sphericity is <0.05, it is associated with each other between variables, and it has a meaning to think about common factor.

This exploratory factor analysis revealed 4 factors from 10 variables on a sample of 103 industries. The analysis can describe variability among observed and correlated variables in terms of a lower number of unobserved variables. According to Table3-2, as significance of Goodness-of-fit Test is >0.05, to have chosen 4 factors is not inappropriate.

Table3-3: Pattern Matrix

	Factor			
	1	2	3	4
LAN	− .031	− .063	.302	.086
Sales	.633	.025	.215	− .194
Purchase	.117	.005	.845	.059
Design	− .213	.156	.154	.888
Production	.456	− .228	.011	.532
Inventory	.825	.029	.049	.116
Distribution	.824	.139	− .160	.030
Cost	.258	.616	− .185	.054
Accounting	.025	.802	.190	− .060
Personnel	− .020	.947	− .066	.014

Extraction Method: Maximum Likelihood.
Rotation Method: Promax with Kaiser Normalization.
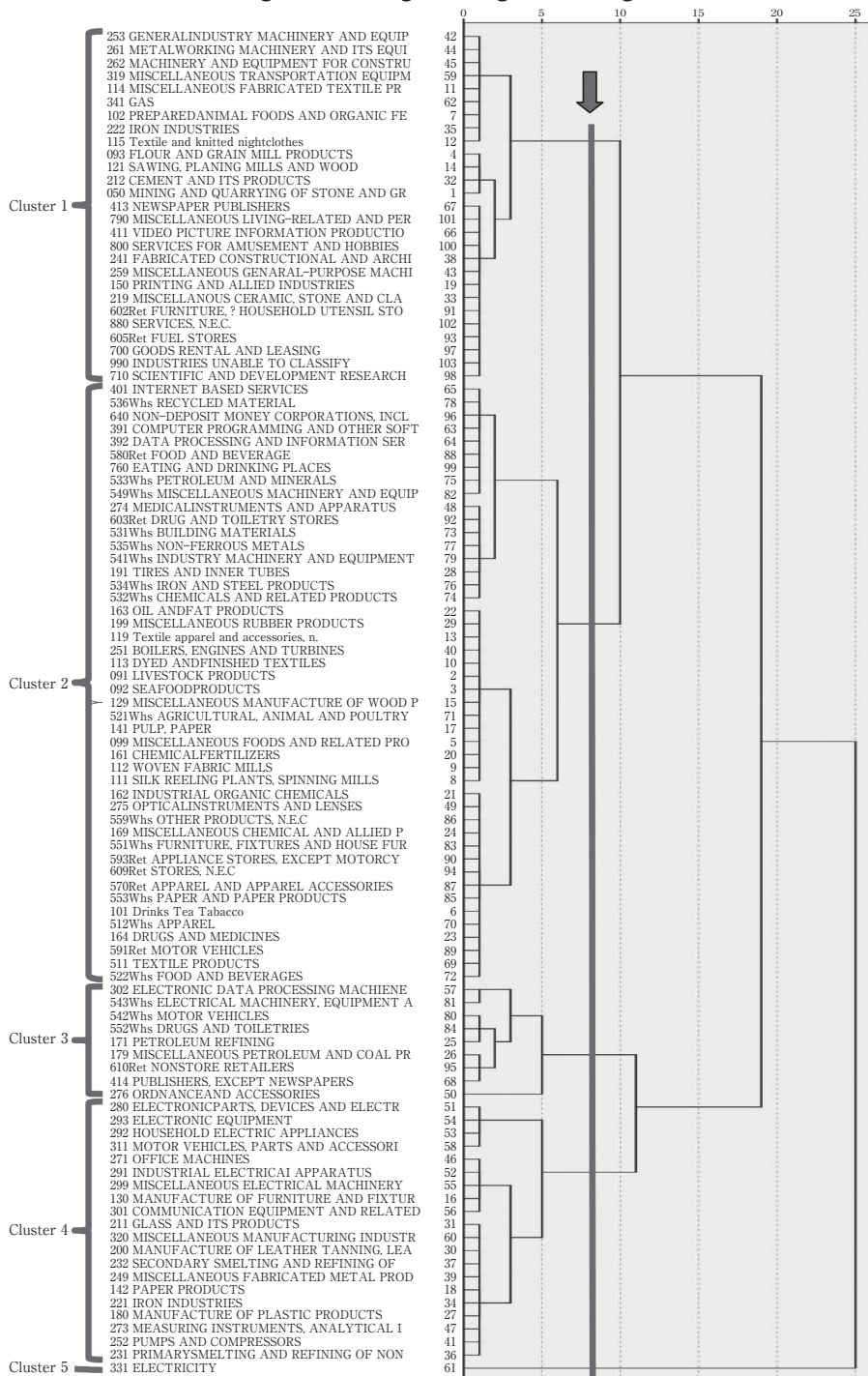
105

Figure 1: Dendrogram Using Ward Linkage

Table4: Industry name of each cluster

Cluster	Industry	Cluster	Industry	Cluster	Industry
1	253 GENERALINDUSTRY MACHINERY AND EQUIP	2	401 INTERNET BASED SERVICES	3	302 ELECTRONIC DATA PROCESSING MACHIENE
	261 METALWORKING MACHINERY AND ITS EQUI		536Whs RECYCLED MATERIAL		543Whs ELECTRICAL MACHINERY, EQUIPMENT A
	262 MACHINERY AND EQUIPMENT FOR CONSTRU		640 NON-DEPOSIT MONEY CORPORATIONS, INCL		542Whs MOTOR VEHICLES
	319 MISCELLANEOUS TRANSPORTATION EQUIPM		391 COMPUTER PROGRAMMING AND OTHER SOFT		552Whs DRUGS AND TOILETRIES
	114 MISCELLANEOUS FABRICATED TEXTILE PR		392 DATA PROCESSING AND INFORMATION SER		171 PETROLEUM REFINING
	341 GAS		580Ret FOOD AND BEVERAGE		179 MISCELLANEOUS PETROLEUM AND COAL PR
	102 PREPAREDANIMAL FOODS AND ORGANIC FE		760 EATING AND DRINKING PLACES		610Ret NONSTORE RETAILERS
	222 IRON INDUSTRIES		533Whs PETROLEUM AND MINERALS		414 PUBLISHERS, EXCEPT NEWSPAPERS
	115 Textile and knitted nightclothes		549Whs MISCELLANEOUS MACHINERY AND EQUIP		276 ORDNANCEAND ACCESSORIES
	093 FLOUR AND GRAIN MILL PRODUCTS		274 MEDICALINSTRUMENTS AND APPARATUS	4	280 ELECTRONICPARTS, DEVICES AND ELECTR
	121 SAWING,PLANING MILLS AND WOOD		603Ret DRUG AND TOILETRY STORES		293 ELECTRONIC EQUIPMENT
	212 CEMENT AND ITS PRODUCTS		531Whs BUILDING MATERIALS		292 HOUSEHOLD ELECTRIC APPLIANCES
	050 MINING AND QUARRYING OF STONE AND GR		535Whs NON-FERROUS METALS		311 MOTOR VEHICLES, PARTS AND ACCESSORI
	413 NEWSPAPER PUBLISHERS		541Whs INDUSTRY MACHINERY AND EQUIPMENT		271 OFFICE MACHINES
	790 MISCELLANEOUS LIVING-RELATED AND PER		191 TIRES AND INNER TUBES		291 INDUSTRIAL ELECTRICAl APPARATUS
	411 VIDEO PICTURE INFORMATION PRODUCTIO		534Whs IRON AND STEEL PRODUCTS		299 MISCELLANEOUS ELECTRICAL MACHINERY
	800 SERVICES FOR AMUSEMENT AND HOBBIES		532Whs CHEMICALS AND RELATED PRODUCTS		130 MANUFACTURE OF FURNITURE AND FIXTUR
	241 FABRICATED CONSTRUCTIONAL AND ARCHI		163 OIL ANDFAT PRODUCTS		301 COMMUNICATION EQUIPMENT AND RELATED
	259 MISCELLANEOUS GENARAL-PURPOSE MACHI		199 MISCELLANEOUS RUBBER PRODUCTS		211 GLASS AND ITS PRODUCTS
	150 PRINTING AND ALLIED INDUSTRIES		119 Textile apparel and accessories, n.		320 MISCELLANEOUS MANUFACTURING INDUSTR
	219 MISCELLANOUS CERAMIC, STONE AND CLA		251 BOILERS,ENGINES AND TURBINES		200 MANUFACTURE OF LEATHER TANNING, LEA
	602Ret FURNITURE.?HOUSEHOLD UTENSIL STO		113 DYED ANDFINISHED TEXTILES		232 SECONDARY SMELTING AND REFINING OF
	880 SERVICES, N.E.C.		091 LIVESTOCK PRODUCTS		249 MISCELLANEOUS FABRICATED METAL PROD
	605Ret FUEL STORES		092 SEAFOODPRODUCTS		142 PAPER PRODUCTS
	700 GOODS RENTAL AND LEASING		129 MISCELLANEOUS MANUFACTURE OF WOOD P		221 IRON INDUSTRIES
	990 INDUSTRIES UNABLE TO CLASSIFY		521Whs AGRICULTURAL, ANIMAL AND POULTRY		180 MANUFACTURE OF PLASTIC PRODUCTS
	710 SCIENTIFIC AND DEVELOPMENT RESEARCH		141 PULP, PAPER		273 MEASURING INSTRUMENTS, ANALYTICAL I
			099 MISCELLANEOUS FOODS AND RELATED PRO		252 PUMPS AND COMPRESSORS
			161 CHEMICALFERTILIZERS		231 PRIMARYSMELTING AND REFINING OF NON
			112 WOVEN FABRIC MILLS	5	331 ELECTRICITY
			111 SILK REELING PLANTS, SPINNING MILLS		
			162 INDUSTRIAL ORGANIC CHEMICALS		
			275 OPTICALINSTRUMENTS AND LENSES		
			559Whs OTHER PRODUCTS, N.E.C		
			169 MISCELLANEOUS CHEMICAL AND ALLIED P		
			551Whs FURNITURE, FIXTURES AND HOUSE FUR		
			593Ret APPLIANCE STORES, EXCEPT MOTORCY		
			609Ret STORES, N.E.C		
			570Ret APPAREL AND APPAREL ACCESSORIES		
			553Whs PAPER AND PAPER PRODUCTS		
			101 Drinks Tea Tabacco		
			512Whs APPAREL		
			164 DRUGS AND MEDICINES		
			591Ret MOTOR VEHICLES		
			511 TEXTILE PRODUCTS		
			522Whs FOOD AND BEVERAGES		

Table3-3 shows that pattern matrix after Promax rotation with Maximum Likelihood extraction. As the factor loadings of Sales, Inventory and Distribution are high, the first factor can be named as "Sales division". Like the following, the second factor is "In-company management" because of high levels of cost control, accounting and personnel management. The third factor is "Procurement" because of level of purchase, and the forth factor is "Manufacturing" because of high levels of design and production control.

Table5: Average Factor Score of each cluster

Factor	Name	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
1	Sales Division	-1.04	0.13	1.93	0.19	0.96
2	In-company Management	-0.57	-0.13	1.27	0.22	5.41
3	Procurement	-0.56	-0.07	0.58	0.42	4.45
4	Manufacturing	-0.03	-0.50	-0.27	1.00	6.15

Then in order to classify 103 types of industry, cluster analysis is conducted with these factor scores.

Figure 1 is a result of hierarchical cluster analysis applying the Ward Linkage method. It is divided into five clusters as shown in the figure. Table 4 is the type-of-industry list of each cluster. Cluster 5 which contains only electricity is firstly classified as other types of industry. Cluster 3 and 4 work on e-business at high level than Cluster 1 and 2. Table 5 is average factor score & characteristics of each cluster.

Implications

According to the factor analysis, e-business implementation can be classified into "Sales division", "In-company management", "Procurement" and "Manufacturing". This suggests the priority matter of each company is reflected. First, a type of industry to suffer from the competition with other companies tackles "Sales division" for customer satisfactions or marketing. Second, "In-company management" could be important for a type of industry to push forward information integration and employee management in the company or the cost reduction of the indirect section. Third, industries which work on cost reduction with strong bargaining ability to the supplier could be tackling "procurement" e-business. And some manufacturing industries work on "manufacturing" e-business.

The cluster analysis shows the characteristic of the type of industry to perform e-business. Cluster 5 which contains only electricity is firstly classified as other types of industry. The cluster has the highest score except "Sales Division" than other clusters. Cluster 1 has very low score especially "Sales division" and "In-company management". The reason may be why it has traditional manufacture such as mining and wood manufacture. Cluster 2 has also low score especially "Manufacturing" because it has traditional distributor sector such as apparel, agricultural or furniture wholesales. Therefore, "Sales Division" is performed better than other e-business. On the other hand, Cluster 3 has high score other than manufacturing because it has non-store retailer and electrical or motor wholesales. And Cluster 4 has major manufacture industries such as electronic, motor vehicles and communication, which work on e-business totally.

Limitations and future Research

This study has two limitations. First, as the data used for this analysis is already totaled for every type of industry, the reply situation for each company is not reflected. Though the government statistics are collecting data comprehensively, it is very rare to have released each data. After

taking into consideration in a respondent's privacy, an indication of individual data is desired.

Second, the purpose or attitude companies work on e-business are not taken into consideration though analyzed based on the implementation rate of e-business. Not only action data but attitude data and consciousness data are important. The future research should analyze why companies work on e-business through an interview or questionnaire survey.

Conclusion

This study is an exploratory analysis that the backgrounds of e-business implementation for a type of industry because companies which perform e-business by the spread of online networks in recent years are increasing. As a result of factor analysis, e-business was classified into four factors, for sale to customers, the management action in own company, procurement activities, and manufacturing activity. Then, through the conducted cluster analysis, it was classified into five clusters according to the grade of execution of e-business, and the contents of execution.

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